New strategy of cancer vaccination by a hybrid bacteriophage vector and a malaria vaccine.

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Cancer vaccine has gained much interest in the field of cancer immunotherapy. Many types of strategies including tumor cell lysate, dendritic cells and neo-antigens have been tested in pre-clinical and clinical research. Although concept of cancer vaccine is simple and straightforward, the strategies remain challenging in clinical trials. Here, we propose a new strategy to improve the impact of cancer vaccination. A bacteriophage (phage) vector developed by our group was used as a gene delivery system to express a malaria antigen on tumor cells. The vector is systemically targeted to solid tumors with high specificity via the cyclic RGD4C (CDCRGDCFC) ligand on its capsids to bind to the $\alpha_V\beta_3$ integrin receptor on the tumor cell surface and tumor blood vessels. Compatible malaria vaccine was applied to stimulate the immune response against the tumors. Preliminary outcome was achieved as follow. The vector mediated desirable expression of the malaria target antigen on EF43.fgf4 breast tumor cells. The therapeutic strategy showed a promising efficiency on stimulating specific $CD8^+$ T cells response which subsequently led to tumor cell killing. *In vivo*, the delay of tumor progress and extended survival of tumor-bearing mice were also achieved. These data prove feasibility and efficacy of this combination of tumor-targeting phage vector and malaria vaccine in cancer immunotherapy.